

# PATENT ABSTRACTS OF JAPAN

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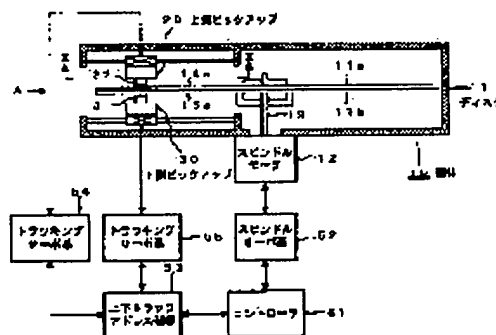
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## (54) OPTICAL DISK DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To miniaturize an optical disk device capable of performing both- surface recording or both-surface reproducing by simplifying its structure.

**SOLUTION:** A first pickup 20 having at least a laser light source arranged oppositely to one surface 11a of a loaded optical disk 11 is disposed so as to be freely slid in the radial direction of the optical disk, and a second pickup 30 having a magnetic field generating coil and a laser light source unitedly arranged oppositely to the other surface 11b of the optical disk 11 is disposed in a position opposite the first pickup 20 holding the optical disk 11 therebetween so as to be freely slid in the radial direction of the optical disk 11. Recording in a track formed in one surface 11a of the optical disk 11 is performed by generating a specified magnetic field with the magnetic field generating coil of the second pickup 30 while irradiating a desired track with a laser light from the laser light source of the first pickup 20.



## LEGAL STATUS

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Irradiating a laser beam by the laser light source, this invention is applied to the recording apparatus of the magneto-optic disk which records by generating a field with a field generating coil, and relates to a suitable optical disk unit.

[0002]

[Description of the Prior Art] Various utilization of the recording device and regenerative apparatus using an optical disk is carried out. For example, after irradiating the laser beam on the track with which the recording apparatus which used the disk called a magneto-optic disk was formed in the disk and raising the temperature of a record location to near the Curie temperature, with the field which irradiates the laser beam of a disk, a field generating coil arranged near the field of an opposite hand, and processing which records the field generated with the coil in the exposure location of a laser beam is performed.

[0003] And in case the information which did in this way and was recorded on the disk by the magnetization direction is reproduced, a laser beam is irradiated at this disk, for example, change (a reflection factor changes with magnetization directions) of the reflection factor of that return light is detected, and recording information is reproduced.

[0004] Drawing 6 is drawing showing an example of the configuration of the conventional pickup section of the recording apparatus of such a magneto-optic disk, revolution actuation of the magneto-optic disk 1 is carried out by the spindle motor 2, and the optical pickup 3 whose sliding was attained radial [ of a disk 1 ] is arranged. Laser beam outgoing radiation section 3a to which this optical pickup 3 irradiates a laser beam at one side (here lower field) of a disk 1 is prepared. And the field generating coil 4 located in the field of a disk 1 upside is connected with the optical pickup 3 through the horseshoe-shaped connection material 5, it has considered as the configuration which the optical pickup 3 and the field generating coil 4 interlock, and moves to radial [ of a disk ], and the field generating coil 4 is always located right above the location where the optical pickup 3 irradiates a laser beam. By having considered as the configuration shown in this drawing 6, the information by the so-called field modulation to a magneto-optic disk 1 is recordable.

[0005] Moreover, there is also a thing of a configuration of being shown in drawing 7 as the pickup section of another configuration of optical-magnetic disc equipment. In this case, while arranging the optical pickup 3 on one side of the magneto-optic disk 1 by which revolution actuation is carried out with a spindle motor 2 free [ sliding ] radially, a fixed field generating means 6 to have the diameter of this disk 1 which is mostly equivalent to a radius is formed in the field of the opposite hand of a magneto-optic-disk 1 upside, and the field which this field generating means 6 generates is changed to it according to recording information. And in case it records on a disk 1, according to change of the recording track, it is made to move radially and only the optical pickup 3 is recorded. Such a configuration can also record information by the so-called field generating to a magneto-optic disk 1.

[0006] By the way, the thing which enabled it to record information on both sides of a disk 1 is proposed as such optical-magnetic disc equipment. Drawing 8 is drawing showing the example of a configuration

of being proposed as optical-magnetic disc equipment which can perform this double-sided record, forms the truck in both sides of a disk by the groove etc. as a magneto-optic disk 1, and prepares 2 sets of optical pickup 3, and 3' to that magneto-optic disk 1. Here, about the optical pickup 3 of one side, laser beam outgoing radiation section 3a which irradiates a laser beam is arranged to the field of the disk 1 bottom, and the field generating coil 4 is connected by the connection material 5 so that the field generating coil 4 may be located in right above [ the ]. About optical pickup 3' of another side, laser beam outgoing radiation section 3a' which irradiates a laser beam is arranged to the field of the disk 1 upside of a location (for example, making the center of rotation of a disk into the symmetry location of an opposite hand) which is different in this optical pickup 3, and field generating coil 4' is connected by connection material 5' so that field generating coil 4' may be located in right under [ that ].

[0007] And using the optical pickup 3 of one side, and irradiating a laser beam on the truck of a request of a lower field, in case information is recorded on the truck formed in the field of the magneto-optic-disk 1 bottom, with the field generating coil 4 connected to the optical pickup 3, the modulation field corresponding to recording information is generated, and information is recorded. Moreover, using optical pickup 3' of another side, and irradiating a laser beam on the truck of a request of an upper field, in case information is recorded on the truck formed in the field of a magneto-optic-disk 1 upside, by field generating coil 4' connected to the optical pickup 3', the modulation field corresponding to recording information is generated, and information is recorded.

[0008]

[Problem(s) to be Solved by the Invention] However, in order to realize double-sided record in this way, when 2 sets of optical pickup and a field generating coil had been arranged, there was a problem which a recording device enlarges. namely, when the optical pickup 3 and the field generating coil 4 of a configuration as shown in drawing 6 are prepared As connection material 5 which connects the optical pickup 3 and the field generating coil 4, the thing of the die length which is mostly equivalent to the radius of a disk 1 is required. For example, since it is necessary to make it the magnitude which can contain this projecting connection material 5 as a recording device since the connection material 5 will be greatly projected from a disk 1 when the optical pickup 3 is located in the outermost periphery of a disk 1, a recording device will be enlarged.

[0009] And if it is the configuration which formed the optical pickup 3, the field generating coil 4, and 2 sets of connection material 5 as shown in drawing 8 in order to realize double-sided record, it will be necessary to constitute a recording device in the magnitude which can contain 2 sets of these connection material, and a recording device will be enlarged further.

[0010] Moreover, although the fixed field generating means 6 as shown in drawing 7 is also applicable to the equipment for double-sided record What generates a field is required for this fixed field generating means 6 by the die length of a disk 1 which is mostly equivalent to a radius. A recording device will be dramatically enlarged like [ a very large-scale field generating means is required, and / in order to enlarge a recording device too, for example, to realize double-sided record, when 2 sets of fixed field generating means 6 are established ] the case of drawing 8 .

[0011] This invention simplifies the configuration of the optical disk unit by which record and playback are made to both sides in view of this point, and it aims at enabling it to miniaturize.

[0012]

[Means for Solving the Problem] In order to solve this technical problem, while arranging the pickup of the 1st to which this invention countered one field of the optical disk with which it was equipped, and the laser light source was allotted at least free [ sliding ] to radial [ of an optical disk ] The pickup of the 2nd to which the field of another side of the optical disk with which it was equipped was countered, and the field generating coil and the laser light source were allotted to one In the location which counters on both sides of the 1st pickup and above-mentioned optical disk, it arranges radial [ of an optical disk ], enabling free sliding. It considers as the configuration performed by generating a predetermined field with the field generating coil [ 2nd / the ] of pickup, irradiating a laser beam to a desired truck by the laser light source of the pickup of the 1st by record on the truck formed in one field of an optical disk.

[0013] By having considered as this configuration, the pickup of the 1st The pickup of the 2nd which

can set up the truck location to record and performs field generating by the laser beam irradiated from the pickup of the 1st By the laser beam which irradiates this pickup of the 2nd from the laser light source allotted to one, the truck location of the field of the opposite hand of the disk corresponding to the truck location to record is detected, the truck location to record can be set up and the information on arbitration can be recorded on a desired truck location.

[0014]

[Embodiment of the Invention] Hereafter, the gestalt of operation of the 1st of this invention is explained with reference to drawing 1 - drawing 4 .

[0015] As an optical disk 11 with which drawing 1 is drawing showing the configuration of the optical disk unit of this example in a cross section, and this equipment is equipped in this example It has considered as the disk by which the truck (for example, truck by the groove) was formed in both sides of one field 11a of the disk 11, and field 11b of another side by the predetermined method. After irradiating a laser beam, the field modulation of the configuration which can record information in respect of [ 11a and 11b ] each is carried out, and it constitutes as the so-called magneto-optic disk which records information according to the magnetization direction. For example, the optical disk 11 in which double-sided record is possible consists of making two magneto-optic disks with which the truck was formed in one side by the groove etc. rival. In this case, it is made to form in the condition that the track pitch of the truck which is with one field 11a and field 11b of another side in this example, and is formed is made in agreement, and it is in agreement as much as possible also about the truck location (for example, formation location of a groove) of those both sides.

[0016] Next, the configuration of the optical disk unit with which it is equipped with the optical disk 11 constituted in this way is explained with reference to drawing 1 , drawing 2 , and drawing 3 . Drawing 1 is drawing showing the optical disk unit of this example in a cross section, drawing 2 is the sectional view which meets the II-II line of drawing 1 , and drawing 3 is drawing seen from the direction of the arrow head A of drawing 1 . The optical disk unit of this example is considered as the configuration with which it is equipped with an optical disk 11 in a case 10, and revolution actuation of the optical disk 11 with which it was equipped is carried out by the spindle motor 12. And the upside pickup 20 is arranged to one field (top face) 11a up side of the optical disk 11 with which it was equipped, and the bottom pickup 30 is arranged to the field (underside) 11b down side of another side. Each pickup 20 and 30 is two guide shafts 14a and 14b, and 15a and 15b, is radially arranged free [ sliding ] on the disk, sandwiches an optical disk 11, and it has set up each sliding range so that the upside pickup 20 and the bottom pickup 30 may serve as a location which counters up and down.

[0017] Each pickup 20 and 30 is considered as the configuration which can set up a radial location independently. Namely, if the configuration of the upside pickup 20 is shown in drawing 2 , for example ( drawing 2 is drawing which looked at pickup 20 from the disk side) Along with two guide shafts 14a and 14b allotted to radial [ of an optical disk 11 ], and parallel, the upside pickup 20 is considered as the configuration which can carry out a parallel displacement, and it is. The parallel displacement For example, it has considered as the configuration which a location moves on the basis of the predetermined magnet sections 16a and 16b prepared in the outside of two guide shafts 14a and 14b by supplying a predetermined signal to the actuator sections 23a and 23b for linear actuation of the edge of right and left of pickup 20.

[0018] In the upside pickup 20, as shown in drawing 2 and drawing 3 , the laser outgoing radiation section 21 and the field generating coil 22 are put in order and arranged in the direction which intersects perpendicularly with radial [ of a disk ]. Inside the laser outgoing radiation section 21, the detector which detects laser light sources, such as semiconductor laser, optical-path components, such as an objective lens which makes the laser beam from this laser light source irradiate a disk, and the reflected light from a disk is arranged, it is constituted as the so-called optical pickup, and it has considered as the configuration which can perform servo control which makes the upside pickup 20 follow in footsteps of the truck formed in top-face 11a of an optical disk 11 of the laser beam from this laser outgoing radiation section 21 in it. Tracking servo control of the besides side pickup 20 is performed by control of the tracking servo system circuit 54 (refer to drawing 1 ). About the field generating coil 22, it has

considered as the configuration to which the signal which generates the modulation field corresponding to the information recorded on the underside of an optical disk 11 is supplied.

[0019] As it has considered as the same configuration as the upside pickup 20 also with the bottom pickup 30 and is shown in drawing 3 The laser outgoing radiation section 31 and the field generating coil 32 are put in order and arranged in the direction which intersects perpendicularly with radial [ of a disk ], and the interior of the laser outgoing radiation section 31 is constituted as optical pickup. By the laser beam from the laser outgoing radiation section 31 It has considered as the configuration which can perform servo control which makes the bottom pickup 30 follow in footsteps of the truck formed in underside 11b of an optical disk 11. Tracking servo control of this bottom pickup 30 is performed by control of the tracking servo system circuit 55 (refer to drawing 1 ). About the field generating coil 32, it has considered as the configuration to which the signal which generates the modulation field corresponding to the information recorded on the top face of an optical disk 11 is supplied.

[0020] The truck location which the upside pickup 20 and the bottom pickup 30 scan is controlled by the vertical track-address control circuit 53. That is, it is set as the tracking servo system circuits 54 and 55 which control the truck location of each pickup 20 and 30 so that the truck of the address of the same radius location may be scanned by supply of the control signal from the vertical track-address control circuit 53. Setting out of the scan truck in the bottom track-address control circuit 53 of besides is performed based on the command from the controller 51 which controls record actuation and playback actuation of this optical disk unit. Moreover, revolution actuation of the disk 11 by the spindle motor 12 is performed by the control of the spindle servo-system circuit 52 based on the command from a controller 51.

[0021] Thus, according to the optical disk unit of this example constituted, while information is recordable on both sides of an optical disk 11, the recorded information is also reproducible. That is, the scan location (radial location) is set up on the basis of the track address where the upside pickup 20 was formed in top-face 11a of a disk 11, and bottom pickup 30 is made the condition scan the truck of the same radius location by the upper and lower sides by control of the vertical track-address control circuit 53 although the scan location is set up on the basis of the track address formed in underside 11b of a disk 11.

[0022] Therefore, where tracking servo control of each pickup 20 and 30 is stabilized, as shown, for example in drawing 3 , the laser outgoing radiation section 21 of the upside pickup 20 and the field generating coil 32 of the bottom pickup 30 can counter on both sides of a disk 11, and predetermined information can be recorded on the truck location where a laser beam is irradiated by top-face 11a of a disk 11 from the laser outgoing radiation section 21. Moreover, the laser outgoing radiation section 31 of the bottom pickup 30 and the field generating coil 22 of the upside pickup 20 can counter on both sides of a disk 11, and predetermined information can be recorded on the truck location where a laser beam is irradiated by underside 11b of a disk 11 from the laser outgoing radiation section 31. Moreover, at the time of playback, the information recorded on each field 11a or 11b of a disk is reproducible with detection of the pickup 20 by the side of each field, the laser outgoing radiation section 21 of 30, or the return light of the laser beam from 31. In addition, it is not necessary to control the pickup 20 and 30 of the upper and lower sides in the same truck location about the time of this playback.

[0023] In addition, when the laser outgoing radiation sections 21 and 31 and the field generating coils 22 and 32 have been arranged to pickup 20 and 30 like this example, about physical relationship with the truck, the laser outgoing radiation sections 21 and 31, and the field generating coils 22 and 32 which are formed in a disk, it will be in the condition which shows in drawing 4 . That is, when distance to the location where the laser outgoing radiation section and a field generating coil were arranged from this center of rotation O when the center of rotation of a disk 11 was set to O is set to  $r$  and spacing of this laser outgoing radiation section and a field generating coil is set to  $2L$ , a laser beam will be irradiated to Truck T with the inclination shown by  $r/L$  (radian). This inclination becomes the largest at the time of the most inner track of a disk 11.

[0024] Since there is an inclination of such a truck and a laser beam spot, it is considering as the tracking error signal detection configuration in pickup 20 and 30 according to the 1 spot method as a

detection configuration of the tracking error signal for tracking servo control, and exact tracking servo control is attained. As a tracking error signal detection configuration by the 1 spot method, the configuration by the push pull method, the configuration by the sample servo method using a wobble pit, etc. are known, for example. Or the tracking error signal detection configuration by the other 1 spot methods may be applied.

[0025] Moreover, although the location of both pickup 20 and the upper and lower sides of 30 is theoretically in agreement if it controls so that the upside pickup 20 and the bottom pickup 30 scan the same truck location. In the location of the truck in which a disk 11 is formed up and down actually. The error depending on the precision at the time of disk shaping arose, for example, it was another and top-face 11a and underside 11b were fabricated, and when these two sheets are made to rival and a disk 11 is made to constitute, the gap (for example, about 50 micrometers) of the same of a truck location depending on that lamination precision has occurred. For this reason, what is necessary is just to let the modulation field generated from the field generating coils 22 and 32 of each pickup 20 and 30 be the field generated in the range which covers the range of a gap of the truck location of these upper and lower sides. What is necessary is just to make the range of about 100 micrometers specifically generate a modulation field, when a gap [ the direction of + ] of about 50 micrometers and a gap [ the direction of - ] of about 50 micrometers are taken into consideration. As field generating coils 22 and 32 made to generate a modulation field in the range of this level, it will be good with a very small coil.

[0026] It has the effectiveness which can miniaturize an optical disk unit compared with the case where pickup and field generating means of the conventional configuration have been arranged to both sides of a disk because double-sided record and playback of an optical disk (magneto-optic disk) are realizable with the configuration of this example as explained above. That is, it is not necessary to connect the laser light source and the field generating means of countering on both sides of a disk, or to establish the fixed large-scale field generating means, and a miniaturization can be attained while a configuration is so easy. Moreover, while being able to perform record of the information are twice many as this, compared with the disk unit of one side record by the ability of double-sided record to be performed, the data transfer rate recorded can be doubled by performing simultaneous record by both sides.

[0027] Next, the gestalt of operation of the 2nd of this invention is explained with reference to drawing 5. In drawing 5 corresponding to the gestalt of this 2nd operation, the same sign is given to the part corresponding to drawing 1 corresponding to the gestalt of the 1st operation - drawing 4, and that detail explanation is omitted.

[0028] As an optical disk 61 with which the optical disk unit of this example is equipped, one field (underside) 61b is constituted from a magnetization direction as a magneto-optic disk with which information is recorded, and field (top face) 61a of another side is constituted as an optical disk of other configurations. As an optical disk which constitutes top-face 61a, it constitutes from an exposure of a laser beam on the truck formed, for example of the groove etc. with the optical disk called write-once [ which can perform informational record (writing) only once / so-called ] (Write Once). Or it constitutes as a disk only for playbacks with which information was beforehand recorded by the pit etc. as an optical disk which constitutes top-face 61a.

[0029] And like the case of the gestalt of the 1st operation, each prepares the upside pickup 20 and the bottom pickup 40 which can slide on radial [ of a disk ] freely independently, and physical relationship presupposes at the pickup 20 and 40 of both that it is the same as the physical relationship of the upside pickup 20 and the bottom pickup 30 which were explained with the gestalt of the 1st operation. It considers as the pickup by which the same configuration 21 as the configuration explained with the gestalt of the 1st operation, i.e., the laser outgoing radiation section, and the field generating coil 22 were located in a line, and have been arranged about the configuration of the upside pickup 20, and about the bottom pickup 40, only the laser outgoing radiation section 41 is formed and a field generating coil is considered as the configuration which is not prepared.

[0030] And in case information is recorded on underside 61b of an optical disk 61, it sets up so that the laser outgoing radiation section 41 of the bottom pickup 40 and the field generating coil 22 of the upside pickup 20 may serve as a location which counters on both sides of a disk 61 by tracking servo control of

each pickup 20 and 40. In case the information recorded on this underside 61a is reproduced, it is only the return light of the laser beam from the laser outgoing radiation section 41 of the bottom pickup 40, and can reproduce. Moreover, it is possible also about record and playback of an optical disk 61 of top-face 61a only at the laser beam from the laser outgoing radiation section 21 of the upside pickup 20.

[0031] Other parts constitute like the gestalt of the 1st operation.

[0032] Thus, with having constituted, about underside 61b of an optical disk 61, information can be recorded in the magnetization direction by the up-and-down laser beam and up-and-down modulation field from pickup 20 and 40, and one informational record and recorded informational playback can be performed by the laser beam from the upside pickup 20 about top-face 61a of an optical disk 61. By considering as such a configuration, the optical disk of various configurations can be made to be able to rival and the configuration of the optical disk unit which performs the record and playback can be simplified like [ case / where it considers as the optical disk in which double-sided record and double-sided playback are possible ] the case of the gestalt of the 1st operation.

[0033] Thus, the application of an optical disk spreads by considering one field of an optical disk, and the field of another side as another configuration. For example, the processing which system control data, an application program, etc. are beforehand recorded [ processing ] by using one field as the disk only for playbacks, and makes the data with which the user performed and got the application program of one field etc. by making \*\*\*\*\* of the field of another side possible as a magneto-optic disk record on the field of another side is attained. Moreover, the processing which the record data is edited [ processing ] and makes final data record on the field of another side by making \*\*\*\*\* possible by using one field as a magneto-optic disk, and considering as a configuration recordable only once by using the field of another side as an optical disk after making a certain input data record on the field which is once one side is attained.

[0034] In addition, the optical disk unit of a configuration of that the gestalt of the 1st operation explained is used, and one field may be made to perform the record and playback of an optical disk which both sides consisted of as a disk with which the field of another side is carried out by the disk with which information is recorded in the magnetization direction, and information is recorded only by the exposure of a laser beam (it reproduces again).

[0035] Moreover, the optical disk unit of a configuration of that the gestalt of the 1st operation explained and the optical disk unit of a configuration of that the gestalt of the 2nd operation explained are used. both sides may perform the record and playback of the optical disk (the optical disk with which, as for one field, information was recorded beforehand in the pit -- carrying out -- the field of another side -- the exposure of a laser beam -- as the optical disk which only 1 time can record [ informational ] -- a configuration) of a configuration which can be recorded and reproduced only by the laser beam. Moreover, the optical disk unit of a configuration of that the gestalt of each operation mentioned above explained a certain optical disk only to one side from the former which can be recorded and reproduced is equipped, and it may be made to perform record and playback.

[0036]

[Effect of the Invention] According to invention indicated to claim 1, the pickup of the 1st The pickup of the 2nd which can set up the truck location to record and performs field generating by the laser beam irradiated from the pickup of the 1st By the laser beam which irradiates this pickup of the 2nd from the laser light source allotted to one The truck location of the field of the opposite hand of the disk corresponding to the truck location to record is detected. The truck location to record can be set up and the information on arbitration can be recorded on a desired truck location. The configuration to which the laser light source and the field generating coil are not connected can also record information on a disk good. It is not necessary to connect a laser light source and a field generating coil by large-sized connection material, or to establish the fixed large-scale field generating means, and an optical disk unit can be miniaturized.

[0037] According to invention indicated to claim 2, a field generating coil is arranged also to the pickup of the 1st at a laser light source and one. By carrying out by generating a predetermined field with the field generating coil [ 1st / the ] of pickup, irradiating a laser beam to a desired truck by the laser light



source of the pickup of the 2nd by record on the truck formed in the field of another side of an optical disk. The configuration of an optical disk unit at the time of considering as the configuration which can record independent information can be simplified by field generating to both sides of an optical disk, and the optical disk unit in which double-sided record is possible can be miniaturized.

[0038] According to invention indicated to claim 3, about the field of another side of an optical disk. Because only the laser light source [ 2nd / the ] of pickup is used and it was made to perform record to this field about the field of this another side. It constitutes as a disk whose record (writing) is possible only once which is called write-once [ so-called ] (Write Once), and the optical disk unit which performs the double-sided record and the playback at the time of considering as a freely rewritable optical disk can constitute good about one field.

[0039] According to invention indicated to claim 4, about the field of another side of an optical disk, it is having been made to perform only playback of the information recorded on this field by the laser light source [ 2nd / the ] of pickup, it becomes the configuration of performing only playback of the information beforehand recorded on the disk about the field of this another side in the pit etc., and the optical disk unit which performs double-sided playback and record of one side can constitute good.

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[Translation done.]

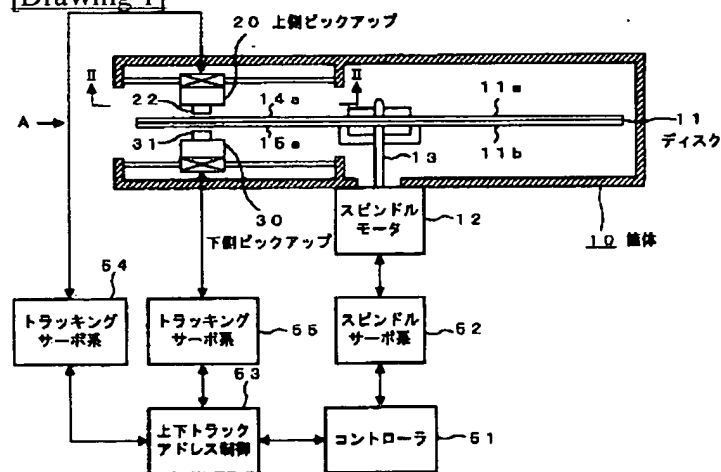
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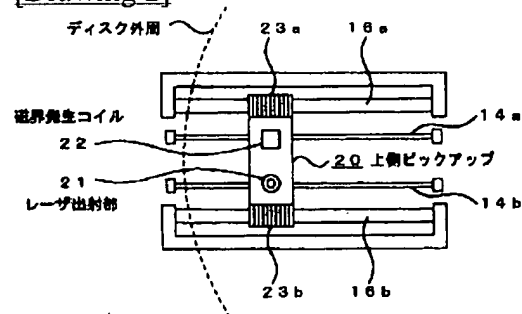
## DRAWINGS

[Drawing 1]



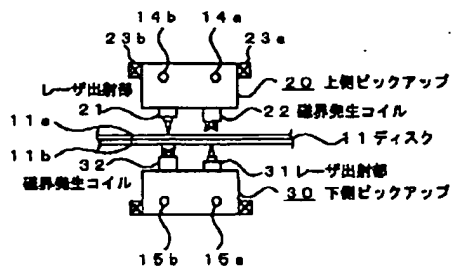
ピックアップの配置と制御機構

[Drawing 2]



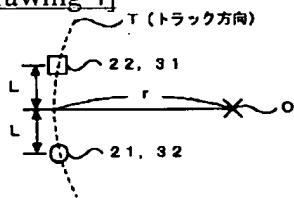
II-II線に沿う断面図

[Drawing 3]



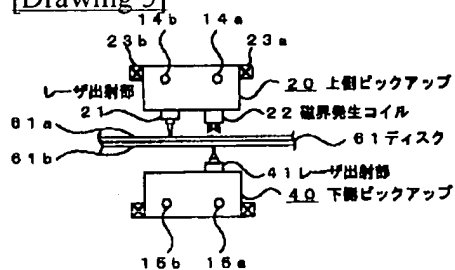
A方向から見た図

[Drawing 4]



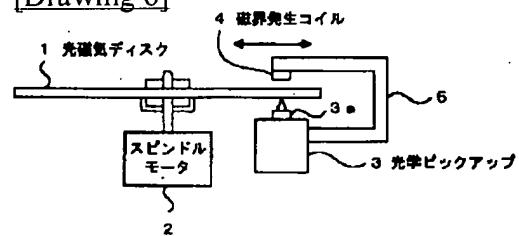
トラックとピックアップとの傾きを示す図

[Drawing 5]



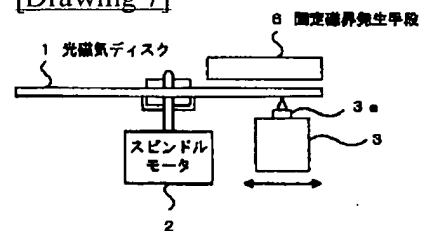
ピックアップの配置

[Drawing 6]



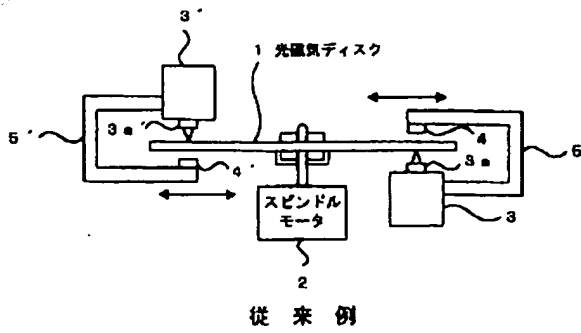
従来例

[Drawing 7]



従来例

[Drawing 8]



[Translation done.]